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Item 4 of the provisional agenda

ADOPTION OF THE FINAL REPORT OF THE WORKING GROUP TO THE TRADE AND DEVELOPMENT BOARD

Draft final report of the Ad Hoc Working Group on the Interrelationship between Investment and Technology Transfer

PART ONE

The present draft report has been prepared in accordance with the request by the Ad Hoc Working Group to the secretariat to prepare a draft of part one of the Group's final outcome.

At its second session, the Ad Hoc Working Group on the Interrelationship between Investment and Technology Transfer agreed that the final outcome of its work would consist of two parts. Part one would cover the findings and part two the conclusions. Accordingly, part one would be based on the case studies presented to the Group; the results of the discussions within the Ad Hoc Working Group; the Oslo Workshop on the Transfer of Environmentally Sound Technologies; and the inputs provided by the secretariat. This part would be submitted as a draft report to the third session of the Ad Hoc Working Group. Part two would be prepared during the third session. The final outcome and the documentation relating to the work of the Ad Hoc Working Group could be produced as a United Nations sales publication.

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ANNEX I Informal discussions at the second session of the Ad Hoc Working Group on the Interrelationship between Investment and Technology Transfer (13-17 December 1993)

[ANNEX II Informal discussions at the third session of the Ad Hoc Working Group on the Interrelationship between Investment and Technology Transfer (21-25 March 1994) (to be added)]

I. Background

1. Pursuant to "A new partnership for development: the Cartagena Commitment", adopted at the eighth session of the Conference, and on the basis of Board decision 398(XXXVIII), which sets out in annex C the terms of reference of the Ad Hoc Working Group on the Interrelationship between Investment and Technology Transfer, three sessions of this Group were held, respectively, on 25-29 January 1993, 13-17 December 1993 and 21-25 March 1994.

2. These meetings helped to provide further insights into the consideration of investment-related technology issues in a changing global context. Increasing liberalization trends, coupled with growing interdependence among nations, the adoption and implementation of structural adjustment programmes, changes in the international division of labour and greater cooperative arrangements among enterprises have, in a period of rapid technological change, created a new setting for investment and technology flows and opened up further possibilities for international economic cooperation.

3. After a period of stagnation, investment flows to a number of developing countries have expanded. However, certain countries were able to attract more of these flows, while others did not benefit from these new trends. Technological capacity-building in some countries, particularly developing countries and countries in transition to a market economy, has also progressed in varying degrees reflecting different and changing national circumstances in a rapidly evolving international environment that required adjustment and further efforts from all actors, including Governments and private enterprises.

II. Findings

A. First session

4. It is against this background that the first session of the Ad Hoc Working Group was held in January 1993. In opening the debate, three guest speakers, invited by the secretariat, addressed the Working Group on investment-related technology issues.

1. Guest speakers

5. Professor Charles Cooper, Director of the Institute of New Technologies, United Nations University, Institute of New Technologies (UNU/INTECH), spoke on three main issues: (i) the evolution in the process of industrial competition; (ii) how problems of competition related to industrialization policies in developing countries; and (iii) implications for policy-making. Mr. Juan Rada, Vice-President (Strategic Alliances), Digital Equipment Corporation International (Europe), addressed three issues that affect competition policies: (i) the clustering of technologies and strategic alliances; (ii) the role of capital markets in shaping investment and innovation capabilities; and (iii) technology as a factor affecting trade in the post-Uruguay Round period. Herbert Oberhänsli, Assistant for

Economic Affairs to the Chairman, Nestlé S.A., referring mainly to Nestlé's experience and to the results of the survey undertaken by European industrialists, outlined the systems of cross-fertilization between economies at different stages of economic development, which stimulated local knowledge creation in production and distribution.

6. The experts' presentations and the discussion which followed them have been included in the "Report of the Ad Hoc Working Group on the Interrelationship between Investment and Technology Transfer at its first session " (TD/B/WG.5/4).

2. Secretariat documentation

7. The secretariat made available two documents for the session - a note and a background document entitled respectively: "Issues for consideration in the establishment of the work programme" (TD/B/WG.5/2) and "The interrelationship between investment flows and technology transfer: an overview of the main issues" (UNCTAD/ITD/TEC/1).

8. The issues and concerns raised in these documents and the discussions which led to the adoption of the work programme have also been covered in the Report TD/B/WG.5/4).

3. Outcome

(a) The process

9. The interventions by the guest speakers and the secretariat documentation led to stimulating discussions among the experts whose experiences enriched the debate, helped to set the direction of the work and determined the characteristics of the process that was to guide the deliberations of the Ad Hoc Working Group. In line with the Cartagena Commitment, the work was seen as a consensus-building and action-oriented process and the output as a major report on investment and technology. The report was to reflect, *inter alia*, (i) the results of discussions at meetings within the Ad Hoc Working Group, and (ii) country case studies.

(b) Specific issues

10. At its first session, the Ad Hoc Working Group agreed on the following three main sets of issues that constitute the components of the unifying theme of the interrelationship between investment and technology transfer: (a) investment flows, transfer of technology and competitiveness ; (b) technological capacity-building in developing countries, particularly the least developed countries and countries in transition to a market economy; and (c) transfer and development of environmentally sound technologies.

(c) Method of work

11. Besides agreeing on its work programme, the Ad Hoc Working Group defined its method of work which was to centre on the exchange of national experiences based on case studies prepared by countries on a voluntary basis. It also requested specific inputs by the UNCTAD secretariat, which were reflected in the secretariat documentation submitted to

the second and third sessions, and the organization of a workshop in cooperation with the Norwegian Government on the "Transfer and development of environmentally sound technologies".

B. Second session

1. Guest speakers

12. Based on the agreed work programme, including the orientations and directives given at its first session, the Ad Hoc Working Group held its second session in December 1995. It benefited from the intervention of six guest speakers from different backgrounds, who had been invited by the secretariat. The presentations and the ensuing discussion have been reported in the summary report of the "Informal discussions during the second session of the Ad Hoc Working Group on the Interrelationship between Investment and Technology Transfer" (annex I).

13. The informal discussions opened with a keynote address by Professor Lynn Mytelka (Carleton University, Ottawa, and LAREA-CEREM, Université, Paris-X) on the theme of strategic partnering and its implications for developing countries. Professor Mytelka argued for the relevance and importance of strategic partnerships within and across developing countries as an important means of technological capacity-building and of raising competitiveness in these countries. She underlined the need for institutional mechanisms that would support the development of networking at the national, regional and international levels, supported by both the private and public sectors.

14. The Ad Hoc Working Group also had an opportunity to hear the views of the private sector on foreign investment and technology transfer to developing countries and countries in transition. Mr. Samir Marrakchi (President and Director-General of the Société de Participation et de Promotion des Investissements (SPPI), Tunisia), Mr. Viorel Catarama (President and Director-General of Elvilla International, Romania), and Mr. Joseph Brenner (Development Consultant, Du Pont de Nemours International, Switzerland), addressed the Group and participated in the general discussion, as well as in a panel discussion on technological capacity-building in developing countries.

15. The panel discussion was organized for the purpose of providing further insights into the issues under discussion. Mr. Samuel Wangwe (UNU/INTECH), Mr. Tom Ganiatsos (UNCTAD), and Mr. Jorge Katz (ECLAC) presented the results of research being carried out respectively in Africa, Asia and Latin America. The presentations by the experts were followed by a fruitful exchange of views on such diverse issues as: the need to distinguish between firms' and national policies and strategies; the role of infant industry protection and the importance of macroeconomic stability.

2. Case studies

16. The meeting also benefited from the presentation of 14 case studies submitted by countries at different stages of development and facing different situations. Preliminary findings were given for the case study by Brazil. [The final draft of this study was presented at the Ad Hoc Working Group's third session.] The studies, in order of presentation, are included in annex I.

17. These case studies and their presentations have given an account of the opportunities and challenges faced by those countries and their enterprises in promoting investment and technological capacity-building. They have stimulated discussion and promoted the sharing of experiences and perceptions in this area. The discussion contributed to the process of learning in the formulation and implementation of investment-related technology policies. It also helped to identify areas where some progress has been made and where further efforts need to be concentrated (see annex I).

18. More specifically, it highlighted the efforts deployed in promoting technological capacity-building and the role of technology transfer in this regard. The contribution of foreign technology inputs to capacity-building was emphasized, including ways and means of strengthening this relationship. Particular attention was given to capital goods imports and foreign direct investment as two important channels of technology transfer. It was noted that modalities of technology transfer have diversified to include less standard forms involving different actors. In this respect, the means in use encompassed new forms of investment, such as joint ventures, management contracts, subcontracting and franchising. Licensing, literature surveys, scientific exchange and participation in fairs were other less formal modes of technology transfer.

19. Different countries pointed to the reforms carried out and incentives adopted to liberalize their foreign investment regimes and attract investment and technology flows. These incentives included a more stable regulatory framework, improvement of intellectual property rights protection, relaxation of conditions and easing of registration procedures for foreign investment, development of science and technology infrastructure, progress in human resource development, modernization of the production sector, financial and fiscal incentives, and more coordinated industrial and trade policies.

20. Education was given particular attention at all levels in the process of technological capacity-building, including formal education and technical and vocational training. The institutional set-up required for human resource development was also emphasized. The role of public and private training facilities was singled out, including at the firm level, as well as the upgrading of the skills of both trainees and trainers. In view of the rapid changes in technology, it was considered essential for training and explicit learning from experience to be a continuous activity at all levels. While some progress has been made in training and institution-building in many countries, linkages with the production sector continue to be weak.

21. This also applies to linkages between R&D and industry. A closer relationship would facilitate the commercialization of R&D results. It was deemed necessary for a more effective use to be made of R&D resources and for the private sector to play a more active

role in financing and carrying out such activities. In this respect, particular attention was given to the creation of conditions favourable for the development of small- and medium-sized enterprises to enable them to become more active agents in the transfer and development of technology. Moreover, the development of R&D capacity was viewed as an important element in the process of technological innovation, and related policies had been promoted in varying degrees by all countries.

22. Efforts to promote technological capability-building, including technological innovation coupled with a stable macroeconomic and regulatory environment, create favourable conditions for enhancing international competitiveness. Selecting among competing priority areas those on which countries could concentrate their human and financial resources has, together with flexibility, become a particularly important element in the policies of Governments and enterprises in the present period of rapid change. However, differences in the levels of development and situations of countries call for different sets of considerations and differing approaches to capacity-building and competitiveness. This may be even more necessary at a time when integrating environmental considerations is increasingly becoming a fundamental element in meeting sustainable development objectives.

3. Environmentally sound technologies

23. In accordance with its work programme, the Ad Hoc Working Group considered the issue of the transfer of environmentally sound technologies. It had before it the report of the Workshop on the Transfer and Development of Environmentally Sound Technologies (ESTs) (UNCTAD/ITD/TEC/13), which had been organized jointly by the UNCTAD secretariat and the Government of Norway in Oslo from 13 to 15 October 1993.

24. According to the findings of the Workshop, integrating environmental considerations into endeavours to meet sustainable development objectives would entail the assessment of environmental impacts at the initial planning stage of project execution. While the role of the private sector in generating and transferring such technologies was underlined, emphasis was laid on the need to develop domestic capabilities for harnessing imported technology to promote sustainable development. The presentation and discussion of case studies have thrown further light on these considerations and approaches.

25. The conclusions of the Workshop included a wide array of suggestions. Attention was drawn to a number of initiatives and priority elements that had already been taken up and were in the process of being implemented, sometimes on an experimental basis.

26. The discussion in the Ad Hoc Working Group touched upon certain specific points such as: the role played by the private sector in R&D and dissemination of ESTs; the impact of structural adjustment programmes on EST diffusion in developing countries in this respect; factors that affect the diffusion of ESTs; the importance of training in capacity-building for ESTs as for other technologies; and the need for special mechanisms to diffuse ESTs more broadly in developing countries (see annex I).

4. Secretariat documentation

27. During its second session, the Ad Hoc Working Group also considered two secretariat documents, submitted, namely, "The review of the work of the United Nations system and selected organizations dealing with investment-related issues" (TD/B/WG.5/6) and "Fostering technological dynamism: evolution of thinking on technology capacity-building and competitiveness" (TD/B/WG.5/7).

28. The former document provided inputs concerning the contributions by various organizations of the United Nations system and other organizations, in their respective fields of competence and in diverse sectors as well as through policy research and technical cooperation activities, to promoting foreign direct investment and linking it to local technological development opportunities, including capability-building. Human resource development and institution-building have also been the focus of attention of many of these organizations in their operations in different countries in Africa, Asia and Latin America. These organizations have also supported intergovernmental consideration of approaches for promoting sustainable development, including through the setting-up of data bases to help in the dissemination of information concerning the sources, transfer and development of environmentally sound technologies.

29. As the review and analysis of the literature showed (TD/B/WG.5/7), technology and the process of technological change have been increasingly recognized by scholars, decision-makers and policy-makers as an important factor in economic growth and international competitiveness. The growing preoccupation with technology has been accompanied by important shifts in emphasis from technology transfer *per se* to how nations use imported technology to complement their own efforts to accumulate internal technological capabilities. There has also been a growing recognition of the importance of the enterprise as the locus for technological innovations, and of the need for the development of linkages among domestic and external sources of technology. The debate on strategies for achieving national competitiveness has also become more focused, with the emphasis being placed on selectivity, flexibility and provision of incentives in addition to the provision of a stable macroeconomic environment.

30. As regards the least developed countries and low-income regions elsewhere, knowledge about workable technological strategies for industry remains extremely inadequate. In contrast, as regards agriculture, a better understanding of the effects of the green revolution has demonstrated that strategies for agricultural development have often been a rather crude attempt to deal with what has now emerged as a sophisticated system of resource management.

31. The Report identified a number of areas where further work would be necessary. Most of these were highlighted during the discussions on the case studies. They include: technology and strategic partnerships; science and technology policies and cohesiveness with other major policies; incentives and support for innovative behaviour; the need for a better understanding of the workings of selective intervention, including criteria for selection and evaluation of policies. Similarly, further empirical research would be needed on developing country experience with intellectual property protection. For the least developed countries, research would be needed on ways through which developing countries could gain enough

expertise to identify desired technologies. Political economy-oriented research would also be needed to identify policy options available to the international community that could (i) encourage greater diffusion of technology, (ii) make a real impact on reducing the marginalization of some countries and (iii) assist in building a broad consensus between donors and aid-receiving countries. Finally, in this respect, more research would be needed to obtain a better understanding of the process of innovation, including the linkages between technology transfer and the development of technological capabilities.

32. In the light of the discussion (see annex I), the secretariat made a number of suggestions for revision to the documents (TD/B/WG.5/6) and (TD/B/WG.5/7), which were reproduced, respectively, in documents (TD/B/WG.5/6/Amend.1) and (TD/B/WG.5/7/Amend.1).

[C. Third Session

1. Guest speakers

TO BE COMPLETED DURING THE THIRD SESSION

2. Case studies

33. The case studies considered are given in annex II.

PRESENTATIONS AND DISCUSSION TO BE COMPLETED DURING THE THIRD SESSION

3. Secretariat documentation

34. During this session the Ad Hoc Working Group also considered a document submitted by the secretariat, namely, "Review of laws and regulations dealing with the transfer and development of technology, an overview" (TD/B/WG.5/10).

35. According to the review in question, considerable attention has been given in recent years, both at national and international levels, to the creation of a legal environment conducive to technology transfer and development. This has led a number of Governments to formulate laws and regulations relating to the transfer, development, adaptation and diffusion of technology. Most developed countries have introduced changes in their competition laws and enforcement policies on restrictive practices in order to stimulate technological innovation, and have passed laws to protect new technologies such as biotechnologies and semiconductor integrated circuits. The main focus in the developing countries has been on the formulation of policies and legislative instruments for the promotion and encouragement of foreign investments and related technology transfer. Many of the latter have liberalized their investment and technology transfer legislation in order to

attract more investment. The new approach taken by countries towards technology transfer has focused more on effective collaboration between partners involved in transfer arrangements rather than on the control of contractual aspects of transactions. More recently, a number of developing countries have also modified their intellectual property legislation to strengthen protection of IPRs or introduce new enforcement measures. At the multilateral level, protection of intellectual property rights has, for the first time, been linked to multilateral trade rights and obligations as a component of the international trading system (Final Act of the Uruguay Round).

TO BE COMPLETED DURING THE THIRD SESSION]

ANNEX I

Informal discussions during the second session of the Ad Hoc Working Group on the Interrelationship between Investment and Technology Transfer (13-17 December 1993)

Summary report by the UNCTAD secretariat

A. Keynote address, guest speakers and panel discussion

1. Keynote address

1. The informal discussions of the Ad Hoc Working Group opened with a keynote address by Professor Lynn Mytelka on the theme of strategic partnering and its implications for developing countries. In the past, investment had been seen in terms of equity and control. Today, on the other hand, it was based on new forms of inter-firm collaborative agreements, better known as strategic partnerships, that contributed more directly to structural competitiveness. Strategic partnerships distinguished themselves from conventional forms of investment in that they were two-way partnerships based on joint and shared production of knowledge as opposed to one-way relationships based on licensing agreements. Many supplier-client relationships in industries as diverse as the automobile, aircraft and clothing industries were being transformed from simple subcontracting arrangements into two-way partnerships where both parties contributed to the design and development of components and final products.

2. However, the ability to form strategic partnerships within and across developing countries depended upon policies that consciously strengthened the science and technology sector and its links to production in the developing world. There was, thus, an important role for local, regional and national Governments to play, individually and in concert, in providing the leadership and creating the policy incentives needed to change traditional habits and practices. Designing programmes to promote strategic partnership at the national and regional levels and leveraging business-financed R&D expenditures through Government funding of technology development and diffusion activities have proven to be powerful instruments altering the historic practices of firms and in stimulating innovation and diffusion in some developed countries.

3. While a number of programmes that laid the building-blocks for innovation had also been developed in some of the more advanced developing countries, similar developments had yet to emerge in the least developed countries. The Governments of these latter had, however, acknowledged the need to develop training that promotes innovation as well as attempting to put in place a policy environment conducive to innovation. To complement these efforts, Professor Mytelka referred to the need for a mechanism, particularly for

Africa, through which enterprises would be encouraged to identify problems and to innovate and through which local resources would be marshalled in support of this endeavour. Endowments from among the largest and most innovative companies as well as governmental agencies and international institutions would ensure the financial and managerial independence of the mechanism and access to technological resources external to Africa.

2. Guest speakers

4. Following the keynote speech, three guest speakers representing the entrepreneurial point of view made presentations. The guest speakers were:

- Mr. Samir Marrakchi, President and Director-General of the Société de Participation et de Promotion des Investissements (SPPI), Tunisia;

- Mr. Viorel Catarama, President and Director-General of Elvilla International, Romania;

- Mr. Joseph Brenner, Development Consultant, Du Pont de Nemours International, Switzerland.

5. The guest speakers discussed foreign direct investment and technology transfer to developing countries and countries in transition.

6. **Mr. Marrakchi** stressed that technological developments were becoming more and more complex, thus widening the gap between countries. Consequently, the cost, time required and form of technology acquisition differed between developed and developing nations. He described both successes and failures in Tunisia's changing economic strategies. Thus, a project with a European partner had failed because of the complexity of the acquired technology, differences in strength between the partners, dependence on subcontractors which had led to cost variations, and lack of an industrial network to back up the project. Another project, where production concentrated on a less complex single component and where the Tunisian company had total mastery of the production chain, had succeeded. The speaker concluded that developing country firms needed to analyse their domestic environment objectively before entering into partnerships. The ability of partners to cope with technology transfer was vital. A dynamic approach allowing for a continuous and gradual "updating" of technology seemed to constitute a successful strategy.

7. **Mr. Catarama** described the obstacles experienced by Romania in its attempt to make the transition from a planned to a market economy. Joint ventures with foreign investors and companies were regarded as a means to speed up the process of privatization, but an insufficient legal framework led to abuses, and some joint ventures had been established with little capital for tax purposes only. In other cases, the technology introduced to Romania was already obsolete in the West. However, experience was increasing, making it easier for the country's firms to assess proposed partnerships. The biggest obstacle was the lack of material and technological resources, as well as funds. Romania needed technology transfer in a variety of sectors such as banking, customs and tourism in the area of service industries; furniture and textile production in the industrial sector; and agriculture.

8. **Mr. Brenner** cited successful experiences of his company with technology transfer in 60 countries on all continents. Training and transfer of expertise were part of the process. In past years, the new opportunities in Eastern Europe had led to a particular increase in the flow of technology. Economic and general operating conditions, including the stability of the political climate, were major factors in his company's decision-making as regards foreign investments involving technology transfer. Adequate mechanisms had to be in place to compensate for higher risks; such safeguards could be provided, for example, through special funds. Companies faced obstacles when their motives were viewed with suspicion and disincentives were put in place discouraging investments. Investments and partnerships needed an environment-promoting entrepreneurship, strengthening the private sector and providing a market place. Foreign partners could help in setting up a local infrastructure for entrepreneurship.

9. The discussion following these presentations involved interventions by different experts from the **Netherlands**, **Switzerland**, **Morocco** and **Chile** and by a representative of ESCAP. It centred on the possible role of strategic alliances in technological and economic development, the applicability of this model in developing countries and the specific role of small- and medium-sized enterprises. It was argued that these would have to join forces in a consortium in order to develop an R&D system relevant to their needs. This was the case for smaller companies even in developed countries. The right kind of institutions and networking opportunities were needed to develop local strength and capabilities.

3. Panel discussion

10. In the afternoon of the first day, a panel discussion was organized during which results from research work carried out in Africa, Latin America and Asia were presented. The discussion was moderated by Professor Mytelka. The panelists were:

- Professor Samuel Wangwe, University of Dar es Salaam, INTECH-UNU;

- Mr. Tom Ganiatsos, Technology Programme, UNCTAD;

- Mr. Jorge Katz, United Nations Economic Commission for Latin America and the Caribbean.

11. In his presentation, **Professor Wangwe** outlined the main findings of a project on export-oriented firms in Africa. The main objective of the project was to understand how, within a broader macro and sectoral policy context, firms had been developing their capabilities to survive and compete in export markets. The findings showed that entry into the export market was influenced by: (a) previous experience and exposure of entrepreneurs to export markets and to sources of technology; (b) partnership with foreign firms; (c) employment of expatriate staff; and (d) family networks with members who lived in foreign countries. Training and technology improvements on a continuous basis were crucial for sustained competition.

12. **Mr. Ganiatsos** reported on preliminary findings from the secretariat's research and technical cooperation project examining technological development and competitiveness in selected East and South East Asian countries. The preliminary findings showed that the contribution of foreign direct investment as compared with other channels for the transfer of technology differed between countries and sectors. It had a more significant impact in Indonesia, Malaysia and Taiwan Province of China than in the Republic of Korea, Thailand and Viet Nam. In the latter group of countries, a large part of the transfer of technology and its contribution to local capabilities had been achieved through acquisition of capital goods, technical assistance, contact with equipment suppliers, private consultants and strategic partnering.

13. Finally, **Mr. Katz**, referring to industrial organization and the international competitiveness of firms in Latin America, stressed the importance of looking at the historical context in analysing these issues. He recalled the period of the 1950s and 1960s when technological capabilities had been built up under import substitution regimes, and emphasized the learning process that had taken place during that period. As the internal market had become saturated in the 1980s, it had become necessary to open up economies gradually and utilize the skills and technological capabilities accumulated during the import-substitution period. However, some regulations were still necessary to ensure that local firms responded to international market signals and developed advanced technologies.

14. The expert from the **United States of America** stated that there was a need to distinguish between firms' and national policies and strategies. To illustrate his point, he referred to the Nintendo Company from Japan which had approached the United States on issues related to intellectual property rights.

15. **Mr. Marrakchi** pointed out the importance of protecting local industries in the early stages of the learning process. He noted that those stages would be vital for developing the technological capability required to enter the international market.

16. The representative of **ESCAP** noted that the presentations on Africa, Asia and Latin America did not provide enough information on macroeconomic conditions. He pointed out that experience with conditions in the Asian and Pacific region indicated that focusing on technology alone was not enough. Referring to comments made earlier, he stated that, in the near future, the move to the global market might not be that easy because of the emergence of trading blocs. He also wondered whether differences between the development experiences of South Asian and East Asian economies could not be explained by the differences in degree and nature of Government intervention and the macroeconomic conditions.

17. **Mr. Ganiatsos** made two observations. First, East Asian countries had highly stable macroeconomic conditions. Moreover, when intervention occurred it was done in such a way that it did not create disturbances in the market. Second, the problem was not import substitution strategy *per se* but the way the strategy was managed. In the East Asian countries, infant industries were encouraged to grow up and adjust to international markets.

18. The expert from **Egypt** wished to know how R&D centres could be induced to undertake joint research with the private sector, promote knowledge transfer and assist in the identification of appropriate technology. He also wondered whether adjustment programmes in developed economies would lead to the relocation of fewer R&D industries to developing countries.

19. In response to a comment made concerning the comparability of experiences in different regions, **Mr. Katz** emphasized that there was no single model of development and each country tended to follow its own pattern.

20. **Professor Mytelka** noted that the important lesson emerging from the experience of the Republic of Korea was that a licensing system should be used to acquire and assimilate technologies rather than simply expand domestic technological capacities. She also indicated that deliberate Government policy was important in forging linkages between R&D institutes and the productive sector.

21. The experts from **France** and **Switzerland** emphasized the importance of focusing not only on technology but also on education and training.

22. In response to these remarks, **Professor Mytelka** pointed out that, historically, high levels of literacy were associated with higher levels of technological development. She noted that, in line with the increasing knowledge-intensity of production, the need had arisen for higher literacy rates.

23. The expert from **Germany** noted that the technologies required for domestic, regional and global market competition could be different. In that respect it was important not to focus on global markets only but also to examine opportunities for acquiring technologies that were appropriate in the domestic and regional markets.

B. Country case studies

24. Under agenda item 2, the Ad Hoc Working Group considered a number of country case studies, which comprised, in order of presentation:

(1) China (TD/B/WG.5/Misc.12);
(2) Nigeria (TD/B/WG.5/Misc.6);
(3) Switzerland (TD/B/WG.5/Misc.9);
(4) Philippines (TD/B/WG.5/Misc.17);
(5) Sri Lanka (TD/B/WG.5/Misc.3);
(6) Sweden (TD/B/WG.5/Misc.2);
(7) Netherlands (TD/B/WG.5/Misc.11);
(8) Romania (TD/B/WG.5/Misc.4);
(9) Turkey (TD/B/WG.5/Misc.13);
(10) Chile (TD/B/WG.5/Misc.8);
(11) Argentina (TD/B/WG.5/Misc.10);
(12) Bolivia (TD/B/WG.5/Misc.15);

(13) Venezuela (TD/B/WG.5/Misc.7 and Corr.1);
(14) Republic of Korea (TD/B/WG.5/Misc.5).

Preliminary findings were presented for the case study of Brazil. The final draft of the study will be submitted to the Working Group at its third session.

1. Case studies by China, Nigeria and Switzerland

25. In their presentation, the representatives of **China** outlined some basic elements of the Chinese development strategy which had, *inter alia*, contributed to enhancing the inflow of foreign direct investment and technology transfer since 1979. These included: (i) a stable regulatory environment; (ii) the role of Chinese expatriates in the formation of a domestic capital market; and (iii) a human resource base of skilled and adaptable labour. There had also been an important shift in the national development policy with the launching of reform and deregulation in December 1978. Since then, a stable and favourable regulatory environment had been created for the successful assimilation of foreign direct investment, which China had received from over 100 countries and regions and which was distributed fairly evenly over a number of industries, in particular oil, coal, engineering, electricity, chemicals, medicine, textiles, light industry, farming and agriculture.

26. Foreign direct investment in China had a number of distinctive features: (i) there was extensive scope for investment projects by transnational corporations; (ii) medium- and long-term investment in China was regarded as a focal point in the overseas investment strategy of a number of transnational corporations, e.g. Motorola, IBM, Xerox, Phillips, Citroën, Matsushita, Mitsubishi and Siemens; (iii) the overall technological content of investment projects had been growing and the investment structure gradually improving, as every district offered useful guidance on the placement of foreign capital; (iv) the range of investment had been constantly expanding and since 1992 China had revised and relaxed the conditions for foreign investment, including in tertiary industry; (v) different patterns of investment had been used, including joint ventures and wholly-owned foreign ventures, international leasing, cooperative development in certain geographical zones, joint stock enterprises, transnational companies and holding companies; and (vi) whereas the investment regions in the early years of the expansionary policy had been primarily coastal, at present foreign investment had spread both northwards and inland, attracted by the rich natural and human resources.

27. The current strategy of China was characterized by an active policy to encourage foreign investment in advanced technology and to direct foreign capital away from labour-intensive industry towards technology-intensive sectors. Furthermore, the Government was keen on applying a policy of exchanging market access for technology. On the other hand, thanks to the fact that over 60 per cent of FDI came from Chinese expatriates from Hong Kong, Macao and Taiwan Province of China, the country had managed to produce a number of advanced technologies, especially in machinery, light industry and electronics, which the Government offered as a basis for partnership.

28. One expert from the **Netherlands** asked what role the Chinese diaspora played in foreign direct investment in China. The expert from **China** replied that the expatriate

community had played a very important role, since it created a bridge between Eastern and Western cultures, and since 60 per cent of FDI originated in Hong Kong, Macao and Taiwan Province of China. An expert from the **United States of America** stressed that when China had opened up, the country had begun importing advanced foreign technology to achieve competitiveness, i.e. produce high-quality goods at low prices, rather than continuing an import substitution model. The expert from **China** emphasized the importance of internalizing foreign technologies before undertaking major R&D efforts. One expert stated that the Chinese case was not one of export-led development; rather, priority was given to production for the large domestic market, a strategy which then had export ramifications. The Chinese Government in fact offered foreign companies access to its internal market in exchange for technology imports. However, it also urged foreign investors to export.

29. The expert from **Nigeria** introduced his country's case study, which was based on a survey of 50 firms, domestic, foreign-owned and mixed. The severe economic decline in Nigeria during the 1980s had involved a significant decline in capital formation, in imports of capital goods, and in foreign direct investment, all of which had resulted in a significant deterioration of international competitiveness in manufacturing.

30. The structural adjustment programme initiated in 1986 was seen to have been the single most important factor influencing both technology and investment flows. The exchange rate depreciation had resulted in capital flight and speculative activity which had discouraged productive investment. Thus, the industrial incentives and export promotion schemes that had been implemented had been unsuccessful. While the country had a large labour base and a range of institutions concerned with training, linkages with the productive sector were weak and the technological infrastructure continued to be insufficiently developed.

31. In response to a question by one expert regarding the existence of linkages, the **Nigerian** expert stated that effective mechanisms existed for regional cooperation, which resulted in the commercialization of Nigerian innovations in neighbouring countries.

32. **Mr. Katz** commented that Nigeria appeared to be undergoing consecutive stages of macroeconomic imbalance, stabilization, structural reform and re-establishment of technological capabilities similar to those that many Latin American countries had undergone during the 1970s and 1980s.

33. The expert from the **Netherlands** noted that in the case of Ghana, FDI had started returning only a decade after the country's stabilization programme had been initiated and wondered if the Nigerian case might show parallels. The expert from **Nigeria** replied that, in spite of ongoing political changes, the economy was currently growing and that other problems discussed were temporary in nature.

34. In introducing a report on his country's technology policy, the expert from **Switzerland** referred to two main aspects: (i) the general economic and legal framework; and (ii) certain promotional measures taken by the State in order to diffuse technology. It was particularly through the establishment of basic conditions favourable to the development of enterprise activity that the Swiss Government promoted innovation. These basic conditions included several to which the Swiss authorities attached special importance: (i) a liberal foreign

economic policy; (ii) an open labour policy; (iii) an efficient competition policy; (iv) a moderate fiscal policy; and (v) a well-regulated intellectual property rights framework. Consequently, technology policy was not a domain in itself, but a component of economic policy. In that connection, the role of the State was to promote technical progress while abstaining from intervention, as it was believed that the incentives inherent in a market economy encouraged innovation better than any direct or indirect promotional measure by the State. One of the pillars of Switzerland's technology policy was its emphasis on advanced and varied training at every level. Such training was undertaken by private educational establishments, associations of employers and employees, or public training institutions. Furthermore, particular attention was paid to the training, including the upgrading of skills, of the trainers themselves, as an integral part of economic policy.

35. Promotional measures taken by the State related to technology diffusion through the establishment of centres of excellence, particularly favouring small- and medium-sized enterprises. Switzerland focused its policy on the following aspects:

(i) Freedom of research, with well-defined priorities among research institutions, the private economy and the State established through a "bottom-up" approach to ensure that the technological needs of the private economy, especially small- and medium-sized enterprises, were satisfied, and

(ii) Transfer of knowledge between research units, the economy and the Government.

36. One expert from **Norway** and the representative of **ESCAP** questioned the concept advanced by the Swiss study of a neutral technology policy, as some selectivity in promotion might be practical in providing a framework for technological development and the achievement of competitiveness. The expert from **Argentina** wondered about the role of Government in determining technological requirements, particularly in efforts to link research and productive sectors. The expert from **Switzerland** replied that, while the Government should not decide on the priority of programmes, technology policy could not be neutral. The formulation of programmes and policies was a complex process involving the productive sector, research institutes, universities and the Government, which should take into account the particular needs of the economy and of small- and medium-sized enterprises. In this context, the Government's role was that of a catalyst. Initiatives, on the other hand, should be left to the private sector, as their objectives were practical and their focus user-oriented. In Switzerland, Government financial contributions to research were currently limited to 3 per cent of total R&D expenditures. **Mr. Katz** emphasized in that context that, while Switzerland was currently pursuing a relatively neutral technology policy, in the past that had not always been the case. He thus suggested introducing a historical perspective into the discussion.

2. Case studies by the Philippines, Sri Lanka and Sweden

37. In introducing his country's case study, the expert from the **Philippines** said that, despite his country's poor economic performance in recent years, it had started, since the beginning

of 1993, to display strong indications of an upturn. This was reinforced by two important factors, i.e. political stability and participation in the ASEAN free trade area.

38. Foreign direct investment was being encouraged in numerous sectors and a number of incentives to attract such investment were in place as, for example, a long-standing patent law and a new environmental code. Technological capacity-building was also being given priority to sustain the development process through the Science and Technology Master Plan (STMP), developed in consultation with the private and public sectors. This plan comprised a three-pronged strategy for modernizing the productive sector through: (i) technology transfer and commercialization; (ii) upgrading of research and development capabilities; and (iii) developing science and technology infrastructure, manpower resources and science culture.

39. The implementation of this strategy was being operationalized through the Science and Technology Agenda for National Development (STAND) Philippines 2000, which brought together the goals of technological capacity-building and improved export performance. Its main items were the selection of 15 export winner sectors; the consideration of basic domestic needs; the development of support industries (packaging, steel and chemicals); and the need to improve productivity in the coconut industry, including research into product diversification. The strategies envisaged to address these items were: the utilization of emerging technologies; increased private sector participation; networking at the domestic and international levels, particularly in and through ASEAN; manpower development; review of policies not directly linked to science and technology but which affected those areas; and technology management. The sources of funding for this programme were at the national level in both the public and private sectors, and at the international level, both bilateral and multilateral.

40. Related issues confronting the private sector included the need to modernize facilities, especially for small- and medium-sized enterprises. It had become clear that the Government should, for that purpose, facilitate the access of firms to financing, since venture capital in the Philippines was insufficient. Moreover, considerable efforts were being made to draw into the productive sector scientists currently doing research in public institutions which had little prospects of commercialization. The main instrument used for that purpose was consultancy agreements which, in practical terms, represented an attraction for scientists in the form of additional income.

41. In introducing the case study of his country, the expert from **Sri Lanka** referred to the importance his country attached to human resource development, particularly at the primary and secondary levels, as a prerequisite for successful technological capacity-building. He stressed the positive impact of liberalization on the rate of economic growth and per capita income and on FDI flows and exports. He then described in more detail recent trends in FDI flows and the regulatory framework governing FDI. He mentioned that a number of incentives had been introduced to promote FDI, and that emphasis was being put on encouraging technological capacity-building by small- and medium-sized enterprises. He pointed out, however, that FDI was largely concentrated in a few sectors such as garments and textiles and that his country was interested in the diversification of technology flows.

42. The expert from **Sweden** made brief remarks concerning the case study of his country which focused on an example of a successful research park, the Ideon Research Park. The park was an example of the concept of a technopolis, which emphasized the relevance of geographical proximity of public and private research and development centres, rather than proximity between different industrial units. The Swedish experience with technopoleis had arisen as a spontaneous phenomenon, resulting from an opportune symbiosis between firms, universities and municipalities, at a moment when financing was abundant. There were seven successful technopoleis in Sweden. These could accept projects from abroad but provided no scholarships. They were not directly funded by the Government, but by a system of rents or condominiums with private sector participation.

43. In the debate that followed the country case study presentations of the Philippines, Sri Lanka and Sweden, the important role of scientific and technological parks (or technopoleis) was stressed. These parks facilitated the creation of new technologies and, by attracting FDI, helped to overcome the lack of domestic capital, improve R&D and the human resource base, and generate employment and exports, including those of non-traditional sectors. However, some experts said that attempts at deliberate development of such technopoleis had generated mixed results in both developed and developing countries and that it was not clear which factors had led to the success of technopoleis in Sweden and the United States. Research was being undertaken in different parts of the world into the factors driving technopoleis. In this respect, the need was stressed to establish a close relationship between R&D institutions and industry to achieve a success in the commercialization of R&D results. Of particular importance in this context was the involvement of universities in industrial research through a system of incentives. This objective could also be achieved through improvement of the system of training (more engineers), networking of research institutions at the national and regional levels, optimization of laboratories, etc.

3. Case studies by the Netherlands, Romania, Turkey and Chile

44. The expert from the **Netherlands**, introducing his country's case study, emphasized three main topics: capacity-building, technology policy and technology diffusion. Technology policy and infrastructure should be market-oriented or demand-driven so that they encouraged R&D institutions to carry out research on real needs articulated by both the market and society. R&D institutions should derive their financial resources from the market more than from the State.

45. In an environment of limited financial resources, as was the case in the Netherlands and even more so in developing countries, priority had to be given to technology diffusion through a network of centres built for that purpose. Such a network would be able to collect information on relevant research and technologies from abroad and bring this information to private businesses, including small- and medium-sized enterprises. Another important dimension of technology policy was its selectivity or the capacity to choose priority areas on which the country should concentrate its available financial and human resources. This could be done through technology councils or steering groups comprising representatives of both the private and the public sector, researchers and technology forecasters. This method of selectivity had allowed the Netherlands to build a strong

capability in biotechnology. However, selecting an area to concentrate on was in itself a difficult task, since ways of finding that area within the market had first to be devised.

46. In presenting the case study of his country, the expert from **Romania** indicated that the country's legal regime provided incentives for export and in no way hindered imports, thus promoting the transfer of technology to and from Romania. With regard to foreign investment policy, mention was made of three fundamental principles: equal treatment for national and foreign investors, free access to all economic sectors and minimum Government intervention. The contribution of foreign capital and technology to the rehabilitation of the Romanian economy was essential in this period of transition, in particular in sectors such as agro-food processing, energy, transportation, communications, consumer goods and tourism. The Foreign Investment Law of April 1991 provided guarantees and incentives for foreign investors.

47. There were several features characterizing foreign investment in Romania: foreign investors placed their capital, either in kind or in cash, in joint ventures with Romanian companies; the number of such companies was quite large, exceeding 20,000, but the amount of capital invested had been rather modest and heavily polarized, with 0.3 per cent of the total number of companies accounting for 68 per cent of the invested capital; almost all the companies declared themselves to be engaged in several fields of activity in order to seize any opportunity offered by the market, including trade, transportation, tourism, food and agriculture. From the geographical point of view, 86 per cent of the foreign capital came from the OECD countries, and within this group the European Union member countries accounted for 64 per cent of all invested capital.

48. Almost all industrial branches benefited from capital goods imports as a means of acquiring technology. Domestic research and development activities were carried out mainly in research institutes, which were organized as commercial companies, *régies autonomes*, departments within *régies autonomes* or public institutions. The authorities were working on the creation of a new institutional system to ensure application of research findings in the economy through legal and economic incentives.

49. In his presentation, the expert from **Turkey** indicated that the growth rate of GDP had been more than 8 per cent in 1990, and the share of the industrial sector had increased by 9 per cent. The majority of large firms in the manufacturing industry had acquired their technology from domestic sources, including personnel, machinery producers and other firms, and through licensing agreements. Other sources of technology acquisition included literature surveys and assistance of foreign partners and consulting firms. Learning through exportation, imitation, copying, literature surveys, scientific exchange and participation in fairs was also used. In the initial phase of technology acquisition within large manufacturing industries, foreign firms played a smaller role, and it was observed that firms relied mainly on their own initiative in selecting and applying technology, making use of both market-base and non-market-base technology sources. Turkish firms accomplished significant technology transfer through their licensors and their foreign partners.

50. Large firms in Turkey had accumulated a great deal of experience in technology selection. The majority of large firms participating in a questionnaire study had indicated that they had worked on the design of machinery and equipment. Most of these design

efforts were directed not to new models but to the improvement of foreign samples. These types of design activities had contributed to a large extent to technological learning. Local design and domestic production activities were encountered more in cases where the technology was standardized and relatively simple. The present technological capability had been achieved in different stages: while in the 1950s there had been a shift from cotton, sugar and cement to other manufacturing industries, the orientation had changed in the 1970s towards encouraging export-oriented activities necessitating the strengthening of R&D and requiring highly skilled manpower.

51. In presenting the case study of his country, the expert from **Chile** briefly reviewed the macroeconomic context in which technological innovation policy was being designed and implemented. Over the past seven years, annual GDP growth had averaged 6 per cent. Despite the erosion of traditional exports, the export sector had been the most dynamic, and unemployment had decreased to 5 per cent in 1992, the lowest in 20 years. The Chilean technology innovation policy aimed at increasing the country's competitiveness through strengthening the technological innovation capacity of the productive sectors. This had been translated into a programme to modernize enterprises, especially small- and medium-sized ones. A set of instruments had been established, *inter alia*, to facilitate enterprises' access to technical assistance and financial markets, and specific financing mechanisms had been created.

52. At the macroeconomic level, the economy was open to FDI, and a stable environment had been created. Legal and institutional measures had been taken to ensure intellectual property rights and patent protection and quality improvement. Although the advances were remarkable, the challenges were even greater, since competition had increased and new competitive factors had emerged, i.e. productivity and quality. In this context, the development and training of human resources and technological innovation were of crucial importance in the achievement of long-lasting competitive advantages.

53. One expert from the **United States of America**, referring to the country case study of Chile, emphasized that the most interesting lesson that could be drawn was that competitiveness should only not be achieved at the national level but also at the international level; if comparative advantage had diminished in one sector (copper), other market niches should be found. For instance, Chile was exporting fruit and vegetables to the United States during the winter. Kenya was doing the same, and other countries could follow a similar course. The expert from the **United Kingdom** also stressed that no country in the world could be self-sufficient in technology, and therefore efforts should be made to avoid the duplication of R&D activities. A study had shown that in Europe 30 per cent of R&D activities had been duplicated. An expert from the **United States of America** added that the role of the Government in transfer of technology was to clear the way for foreign investment and cooperation between R&D institutions and private enterprise.

54. The expert from **Germany** underlined the need to make provision for the adaptation of technology to local conditions. It was stressed that developing countries should create specific facilities to that end. The representative of **ESCAP** suggested that R&D institutions should be actively involved in the process of adaptation, for example, through the training of engineers and scientists abroad.

55. The expert from **Switzerland** from the private sector stated that "technology" could not be reduced solely to R&D. There were often hidden elements that intervened in the process of technology transfer. They were not related to flows from suppliers to recipients but were part of a process of cross-fertilization between parties.

4. Case studies by Argentina, Bolivia, Venezuela, Brazil and the Republic of Korea

56. The expert from **Argentina**, presenting his country's case study, spoke of the problem of the availability of good indicators for measuring the level of technological innovation and suggested that UNCTAD should continue its research on this matter. Among such indicators he particularly singled out those related to human resource development, which was the prerequisite for technological development and competitiveness. Of particular importance in this context was the measurement of R&D efforts.

57. Argentina was currently investing only about 0.4 per cent of the country's GDP, which was much less than the Vienna target. The structure of this expenditure, with only about 6 per cent spent on development and the rest going to basic research, hindered the process of technological innovation. Another shortcoming was the low level of private sector participation in R&D (about 5 per cent). Technological innovation, however, was not only a matter of greater R&D expenditures, but also of the effective use of such resources, and of the more active involvement of private enterprises in financing and carrying out such activities.

58. Concerning changes affecting the transfer of technology to developing countries, he mentioned the tendency of some companies to restrain the sale of key technology in order not to create new potential competitors in a globalized market. The necessity to pay particular attention to intellectual property rights in connection with "minor" innovations (utility models), breeders' rights and know-how was referred to. He presented the results of case studies of two innovative Argentine firms, which had been able to develop technology and improve their competitiveness despite the modest performance of the country as measured by the traditional indicators on science and technology. He concluded that the private sector had a growing role to play in expanding and diversifying the technological system in Argentina.

59. The expert from **Bolivia**, introducing the Bolivian country study, emphasized that, in 1985, his Government had introduced new economic policies, including fiscal and monetary measures to reduce foreign debt, the liberalization of trade and capital markets, and privatization of State enterprises. Current problems that needed to be resolved concerned the type of incentives required to promote FDI, mechanisms to improve competitiveness, and measures that could help to formulate an educational policy capable of promoting technological capability-building. Whereas the role of the State was to be instrumental in improving academic capabilities and in furthering regional integration, the role of the private sector, supported by the Government, was to forge links with scientific institutions for joint research.

60. The expert from **Venezuela**, presenting his country's case study, emphasized the importance of political instability as a factor hampering economic stabilization in his country. In view of the economic deterioration it had experienced, his country needed a basic text containing realistic policy guidelines. As an economy whose driving force was oil, Venezuela had a long-standing history of foreign investment, which was currently spreading into such other sectors as telecommunications. The nationalization of the oil industry initiated in 1980 had led to a massive transfer of technology. Today, 70 per cent of refining took place outside the country, to a large degree through joint ventures. While R&D institutions existed, particularly in the oil sector, companies still showed only a low degree of technical innovation. The elimination of trade barriers and market liberalization were seen as factors enhancing prospects for technological exchange and the formation of strategic alliances.

61. In presenting the case study of his country, the expert from **Brazil** outlined the role played by the different agents in R&D. The federal Government covered the major part of all expenses in this area, while 25 per cent was covered by local Governments, 12 per cent by State enterprises, particularly such large companies as PetroBraz, and only 6 per cent by the private sector. Government policy was primarily oriented towards innovation and new technologies and processes in both traditional and new sectors. The national technological policy objectives included increasing productivity and improving quality, both of which were regarded as the basis for competitiveness. Brazil wanted to attract more FDI, particularly in the form of technology. To this end, specific measures had been taken in recent years to attract foreign investment, which included easing of registration procedures, protection of FDI and improvement of intellectual property rights protection. The experience of Brazil was considered representative of that of other developing countries with similar socio-economic characteristics, in particular concerning the role of the State in coordinating measures to attract FDI.

62. In presenting the case study of his country, the expert from the **Republic of Korea** traced the national development strategy of his country since the early 1960s, which was characterized by heavy reliance on imports of capital goods and a restrictive FDI policy. This approach had proved to be effective in preserving the country's independence from the dominance of multinationals and had preserved the base of nationally-owned enterprises.

63. His country's success in the acquisition and development of technology was attributed to two factors: (i) entrepreneurial potential and a highly trained workforce resulting from high investment in human resource development; and (ii) an export-oriented policy, which had the effect of exerting pressure on firms to acquire foreign technology and use it effectively in order to be able to compete in the world market. In parallel, it was through the technical assistance extended by overseas buyers that export products conformed with the technical standards required in the recipient countries.

64. Since the early 1980s, the Government had encouraged the transfer of advanced technology through a liberal FDI policy and other incentive measures.

65. One expert suggested that, within the context of FDI, other aspects of the Government's role should also be considered. He referred specifically to joint ventures when companies first had to reach a licensing agreement with the supplier of technology because technology was not supplied by the foreign partner in all cases. Another issue concerned access to

technology by small- and medium-sized companies, particularly in the developing countries. He asked for recommendations by the Ad Hoc Working Group on what could be done to alleviate the problem, e.g. through the establishment of their own R&D capacity.

66. The expert from the **Republic of Korea** underlined the important role played by the Government in giving directions in the field of technology development. In connection with the latter, another expert stressed that in his country companies created consortia in order to resolve technology-related legal problems.

67. In summarizing the main highlights of the Republic of Korea's "success story", the expert from Nigeria asked for further discussion on the following questions: (a) what were the factors that accounted for the success of FDI policy in the Republic of Korea while similar efforts had failed elsewhere, and (b) what accounted for the effective use of scientists in technology assimilation and adoption?

68. In the discussion, the expert from **Venezuela** noted that the present economic situation of many developing countries was characterized by increased indebtedness, structural imbalances in the economy, deterioration in standards of living and income, degradation of the environment, political instability, and dichotomy in the development of State and private sectors. All this hampered the process of technological capability-building in developing countries through national efforts, and thus countries were increasingly relying on FDI as an important source of technology transfer. In view of the stagnation in endogenous technological capability-building, it was necessary for developing countries to work out a viable technological policy based on a realistic approach and taking into account the scientific and social context.

69. Other experts stressed the role of liberalization and privatization processes as positive factors enhancing technological capability-building. They also referred to the different roles which the Government and enterprise sector could play in those processes in that respect. The Government should be more active in technological capability-building, whereas the enterprise sector could be more involved in technology transfer. Other experts highlighted the potential of regional cooperation in enhancing the technological transformation of participating countries, particularly least developed countries.

70. Replying to the questions raised in reference to his presentation, the expert from the **Republic of Korea** said that the liberalization of FDI policy differed between countries, and that its success also depended upon the global capital availability and the availability of local capabilities. In reply to a question raised by the expert from the **Netherlands** concerning the role of Government in inducing R&D, he stated that, in general, cooperation between the productive sector and public R&D institutions had been low, although industry had moved in recent years to set up its own universities. He also noted that programmes designed to increase cooperation between industry and research institutions, similar to those operating in the European Union, did not yet exist in the Republic of Korea.

5. General discussion

71. **Professor Wangwe** observed that the case studies showed differences in the treatment of FDI across the countries studied. While Romania, for instance, gave favourable treatment to foreign investment at the expense of domestic investment, the Governmen. of the Republic of Korea had a history of strong support for domestic industry. Secondly, possibilities for support by OECD countries of technological capability-building in developing countries had not received sufficient attention in the discussions. Thirdly, he noted the particular problems of many African countries, which had not been able to draw longer-term investment commitments. He raised the question of how such investments could be attracted and what role UNCTAD could play in that quest.

C. Workshop on Environmentally Sound Technologies

72. Presenting the report of the Workshop on the Transfer and Development of Environmentally Sound Technologies (ESTs), which had been organized jointly by the UNCTAD secretariat and the Government of Norway in Oslo from 13 to 15 October 1993, the expert from **Norway** said that the Workshop had aimed at identifying some practical guidelines and policy recommendations on how to achieve the objectives contained in the technology chapter of Agenda 21. The various issues had been discussed under the following general headings: general overview of technology environment issues, supply-side issues, demand-side issues, possible new initiatives, and recommendations and summing-up.

73. He stressed that no attempt had been made to arrive at a definition of EST, since it was very difficult to draw a sharp distinction between environmental technologies and other technologies. Nearly all technologies had some kind of environmental impact, and sustainable development meant a successful assessment of environmental impacts at the initial planning stage. The role of the private sector in generating and transferring technologies was emphasized with regard to the supply of ESTs. On the demand side, it was generally acknowledged that domestic capability to select, adapt, use and develop technology was a precondition for successfully harnessing imported technology to promote sustainable development. It was underlined that capacity-building for ESTs was not essentially different from capacity-building for technology in general, nor was the relationship between technological progress and competitiveness.

74. The conclusions of the Workshop included a wide array of suggestions. Attention was drawn to a number of initiatives and priority elements that had already been taken up and were in the process of being implemented, sometimes on an experimental basis.

75. In the discussion which followed the presentation, an expert from the **United States of America** underlined the fundamental role played by the private sector in R&D and dissemination of ESTs. In response to a question by the expert from Argentina concerning the impact of structural adjustment programmes on EST diffusion in developing countries, the expert from **Norway** said that Government intervention in the form of a regulatory and incentive framework played an extremely important role in the diffusion of ESTs. Thus,

structural adjustment programmes which aimed at deregulation and reduced Government involvement could also affect the mechanisms available to Governments for EST diffusion.

76. The expert from the **Netherlands** noted that, even if market mechanisms were not yet conducive to the diffusion of ESTs, demand for environmentally friendly products or products manufactured in a sustainable manner was rising in developed countries. The expert from the **United Republic of Tanzania** reiterated that capacity-building for ESTs was not essentially different from technology in general and underlined the role of education and training. He also mentioned the need for special mechanisms to diffuse ESTs more broadly in developing countries.

77. The representative of **UNIDO** described some of his organization's information and technical assistance programmes in pollution prevention and sound production technologies.

D. Secretariat documentation

78. The Working Group discussed the reports provided by the secretariat, namely, "Review of the work of the United Nations system and selected organizations dealing with investment-related technology issues" (TD/B/WG.5/6) and "Fostering technological dynamism: evolution of technology capacity-building and competitiveness" (TD/B/WG.5/7), as well as the bibliographical reference material provided.

79. The expert from the **United States of America**, while praising the quality of the reports, asked for specific formulations in a number of paragraphs to be changed in order to improve their message.

80. The expert from **Argentina** referred to the areas for further research identified in the secretariat's paper (TD/B/WG.5/7). In his view, there was a need for additional research on linkages between technology transfer and capacity-building. In that context, attention should focus on the emerging channels through which technology was being transferred, such as licensing, joint ventures, etc. He also said that the review of the work of organizations should be more extensive as regards the work of UNCTAD.

81. The expert from **Switzerland** called for a careful analysis to provide a better idea of possible overlaps in the work of the different organizations.

82. Representatives from several international organizations commented on the documents and addressed in more detail the activities of their own organizations. The representative of the **International Standards Organization (ISO)** emphasized the importance of the role of standards in technology transfer and the need to develop appropriate capacities in developing countries in that respect. The representative of **UNIDO** referred to his organization's experiences and activities. He focused in particular on the need to identify foreign partners for investments in developing countries, the transfer of environmentally sound technologies and the provisions in the Yaoundé Declaration regarding the promotion of investment and technology. The representative of the **Centre for Public Enterprises** cited the role traditionally performed by such companies with regard to technology and industrial

investments. The current privatization process in developing countries and economies in transition often neglected existing R&D capacities in public enterprises considering them to be unproductive elements. He urged UNCTAD to focus on ways of building on existing technologies and capacities in that process and of developing strategic partnerships among enterprises as an alternative to direct foreign acquisition. The representative of **UNESCO** offered to contribute to the work of the Group and the secretariat the experience of his organization in the area of science and technology innovation policy and a number of other activities ranging from publications to training programmes. The representative of **ESCAP** referred to and provided information on ESCAP's draft action programme on regional cooperation in endogenous technological capacity-building for investment-related technology transfer involving an enhancement of inter- and intra-regional technology flows, the promotion of technology transfer from the more advanced to the less advanced countries, and the provision of national economic climates conducive to the acquisition of technology and technical cooperation among developing Asian and Pacific countries. Collaboration with regional and international organizations would be required during its implementation.

[ANNEX II

TO BE COMPLETED DURING THE THIRD SESSION]